Site Closure Report

Time-Critical Removal Action
Low-Level Radioactive Material
Installation Restoration Sites 2 and 9
Naval Air Station North Island
Coronado, California

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Abbreviations and Acronyms

bgs	below ground surface
BNI	Bechtel National Inc.
CAA	controlled access area
CFR	Code of Federal Regulations
cpm	counts per minute
DCN	Document Control Number
DEH	Department of Environmental Health (San Diego County)
DO	delivery order
EPA	U.S. Environmental Protection Agency
HPGe	high-purity germanium (spectrometer)
IR	Installation Restoration
Jacobs	Jacobs Engineering Group Inc.
LLRM	low-level radioactive material
mg/m^3	milligrams per cubic meter
NaI	sodium iodide
NAS	Naval Air Station
OHM	OHM Remediation Services Corp.
pCi/g	picocuries per gram
PPE	personal protective equipment
ppm	parts per million
PWC	Public Works Center
RAC	Remedial Action Contract
RCS	radiological controls supervisor
RCT	radiological controls technician
SAM	site assessment and mitigation
SWDIV	Southwest Division Naval Facilities Engineering Command
TCRA	time-critical removal action
UMTRA	uranium mill tailings remedial action
yd^3	cubic yards
µCi/ml	microcuries per milliliter

Executive Summary

This site closure report documents the time-critical removal action (TCRA) performed at Installation Restoration (IR) Sites 2 and 9, Naval Air Station North Island. The remediation work occurred from November through December 1998. The work was performed by OHM Remediation Services Corp. under Delivery Order 0123. Regulatory oversight was provided by the Department of Toxic Substances Control and the California Regional Water Quality Control Board, San Diego Region.

The objective of the removal action was to reduce risk to human health and the environment. This was done by removing and packaging for disposal the low-level radioactive material (LLRM) in the upper soil layer – not to exceed 2 feet below ground surface – at predetermined areas of Sites 2 and 9. For this TCRA, LLRM is defined as any soil containing radioactive material at concentrations greater than 5 picocuries per gram (pCi/g).

At Site 2, approximately 70 cubic yards (yd^3) of LLRM was excavated and packaged for disposal; radium-226 was the only radionuclide detected. The excavation footprint was approximately 850 square feet. LLRM was not found at discreet locations in the soil in contrast to expected conditions. The LLRM was observed as a concentrated horizontal lens of dark soil encountered at 6 to 12 inches below ground surface and deeper. The dark soil layer containing the LLRM appeared to consist of smelter slag, ash, and debris that was visibly obvious and consistently measured higher than the action level of 5 pCi/g. The final gamma scan conducted prior to backfilling indicates that LLRM is still present at depths greater than 2 feet below ground surface and that the slag lens extends underneath the landfill cap. All LLRM has been removed between ground surface and 2 feet below ground surface in the area of concern and has been replaced with "clean" soil.

At Site 9, approximately 5 yd^3 of LLRM was excavated and packaged for disposal from the 45- by 45-foot excavation footprint. Of that volume, approximately 2 cubic inches was an isolated source of cesium-137 and the remaining soil was contaminated with radium-226. The final gamma scan conducted at 2 feet below ground surface prior to fill placement did not detect any LLRM remaining at that depth.

The LLRM was packaged at the removal areas and transported to the temporary LLRM storage area set up at Site 9. Five 15-yd^3 covered rolloff bins and nineteen 55-gallon drums were used to contain the soil at Sites 2 and 9, respectively. Two additional 30-gallon drums were stored at the temporary LLRM storage area: one containing the LLRM from Site 10 and the other containing the cesium-137 object removed from Site 9. The LLRM storage area is fenced and locked, with proper signage. The Navy is the custodian of the LLRM storage area and will coordinate the transportation and disposal with the Army.

Site restoration, including backfill and compaction, has been completed at both sites. The fill placed at Site 2 was tested for proper compaction. The testing indicated that the compacted fill exceeded the density requirement.

The TCRA resulted in the removal of LLRM in the near-surface soil (0 to 2 feet below ground surface) at Sites 2 and 9. The TCRA eliminated the identified exposure pathway to the low-level radioactively contaminated materials in the areas of concern at both sites.

Section 1
Introduction

This site closure report summarizes the construction activities completed for the time-critical removal action (TCRA) of low-level radioactive material (LLRM) at Installation Restoration (IR) Sites 2 and 9 located at Naval Air Station (NAS) North Island. The location of NAS North Island is shown in Figure 1.

This report was prepared by OHM Remediation Services Corp. (OHM), with assistance from OHM's Nuclear Services Division, for the Southwest Division Naval Facilities Engineering Command (SWDIV) under Remedial Action Contract (RAC) No. N68711-93-D-1459, Delivery Order (DO) No. 0123.

The remediation activities were performed in general conformance with the approved removal action work plan (OHM, 1998).

1.1 Definitions

The following list presents key terms used throughout this report and explains what each term means.

- action level — The action level for this TCRA is 5 picocuries per gram (pCi/g).
- activity — The radioactivity emitted by a sample. Activity is reported in counts per minute (cpm) (field measurement) or in pCi/g (laboratory measurement).
- cesium-137 — A radioactive isotope of cesium. One of the contaminants removed by this TCRA.
- "clean" — Soil with an activity of less than or equal to the action level.
- contaminated — Soil with an activity greater than the action level.
- HPGe — High-purity germanium (HPGe) spectrometer (laboratory instrument used to measure radiological activity levels).
- LLRM — Low-level radioactive material. The contaminated soil excavated during this TRCA.
- radium-226 — A radioactive isotope of radium. One of the contaminants removed by this TCRA.

1.2 Project Objective and Scope of Work

The objective of this TCRA was to reduce risk to human health and the environment. The primary method of achieving this objective was to remove and package for disposal LLRM in the upper soil layer, not to exceed a depth of 2 feet below ground surface, at IR Sites 2 and 9. The locations of these sites at NAS North Island are shown in Figure 2. For purposes of this TCRA, soil that contained radioactive material at concentrations greater than 5 pCi/g within the upper 2 feet was excavated and packaged for disposal. The action level was based on compliance with the uranium mill tailings remedial action (UMTRA) standard as defined in Title 40, Code of Federal Regulations (CFR), Part 192 and U.S. Environmental Protection Agency (EPA) Memorandum 9200.4-18 (EPA, 1998). OHM transported the packaged soil from Sites 2 and 9 to a newly prepared temporary LLRM storage area at Site 9 for future disposal by the Navy.

The major construction activities associated with this work were as follows:

- Setup of temporary construction facilities, including fencing, staging areas, and a temporary LLRM storage area.
- Excavation of soil that contained LLRM in concentrations exceeding the action level, to a depth of 2 feet below grade.
- Confirmation sampling and analysis of soil using an on-site HPGe gamma spectroscopy system.
- Backfill and compaction of the excavations with soil from the nonimpacted stockpile and clean fill obtained from a construction project at NAS North Island.
- Restoration of the sites to match existing conditions and grade.
- Disposal characterization of the LLRM stockpile.
- Packaging of the LLRM into 30-gallon drums, 55-gallon drums, and 15-cubic-yard (yd^3) rolloff bins.
- Transfer of packaged LLRM to the temporary LLRM storage area.
- Demobilization of temporary facilities, equipment, and personnel.

Additional details of the work are as follows:

- All work was conducted under OHM's Nuclear Regulatory Commission license.
- Disposal of the containerized material is the responsibility of the Navy.

1.3 Project Locations and Background

Project locations and background are presented in the removal action work plan (OHM, 1998).

1.4 Previous Investigations and Preconstruction Documents

Previous investigation and preconstruction documents are addressed in the removal action work plan (OHM, 1998).

1.5 Report Organization

This document was prepared to facilitate the regulatory review process and proceed to closure of this TCRA in the most expedient manner possible. The document summarizes the construction activities performed at the two sites, together with the findings, conclusions, and recommendations for each site. The report is organized as follows:

- **Section 1 – Introduction:** Discusses the project objective and scope of work.
- **Section 2 – Preconstruction Activities:** Describes activities leading up to the excavation activities.
- **Section 3 – Site Work:** Describes the field construction activities undertaken to successfully execute the work plan tasks.
- **Section 4 – Findings, Conclusions, and Recommendations:** Presents findings made during execution of the TCRA and makes recommendations based on information collected.
- **Section 5 – References:** Presents references used in the preparation of this report.
- **Appendix A – Project Photographs.**
- **Appendix B – Laboratory Report.**
- **Appendix C – Air Monitoring.**
- **Appendix D – Activity Calculations.**

1.6 Health and Safety

A health and safety program was implemented and maintained throughout the execution of the work, in accordance with the site health and safety plan in Appendix D of the work plan (OHM, 1998).

The health and safety logs from the on-site work are stored in the permanent project file. No accidents, occurrences, or events took place that required reporting or other actions under the health and safety plan.

Section 2
Preconstruction Activities

Activities discussed in this section were completed prior to the start of site work.

2.1 Site Layout and Subsurface Utility Verification

The site layout for Sites 2 and 9 is described in Sections 3.2 and 4.3 of the work plan (OHM, 1998). Both sites were cleared for subsurface utilities prior to excavation. OHM notified Underground Surface Alert and the U.S. Navy Public Works Center (PWC) prior to the start of excavation activities. These organizations indicated that no utilities were present at either site.

During excavation activities at Site 2, a 2-inch-diameter steel pipe was encountered running diagonally across the excavation area. It was later determined to be an abandoned pipe and was removed.

No utilities were encountered at Site 9 during excavation activities.

A two-room trailer, located approximately 100 yards northeast of the Site 9 excavation area, was used as a temporary laboratory and storage area. The first room was air-temperature controlled and housed the HPGe instrument. The second room was used for storage and also housed the ovens used for drying soil samples. Electricity was provided to the trailer by connecting to the electrical service at Building 742. The electrical connections were performed by PWC.

2.2 Mobilization of Radiation Personnel and Equipment

Pursuant to OHM's Nuclear Regulatory Commission license, the project was supervised by a radiological controls supervisor (RCS), who was an approved license user. The RCS mobilized to the site on November 16, 1998, to conduct preconstruction activities, including setup of the laboratory and calibration of equipment, and to conduct Basic Radiation Worker Training for personnel who would be accessing the controlled access area (CAA). The RCS's primary function during excavation activities was to operate the laboratory instrumentation.

On November 30, 1998, a radiological controls technician (RCT) mobilized to the site to assist the RCS in implementation of the excavation activities. The RCT's primary responsibility was to conduct field operations, including surface scans, excavation of the LLRM, on-site air monitoring, and enforcement of the Radiation Work Permit. Field labor was performed by OHM personnel who had completed the Basic Radiation Worker Training.

The field equipment necessary for implementation of the LLRM excavation activities was mobilized to the site from several locations. In an effort to reduce costs, equipment was

obtained from the warehouse of government-owned equipment managed by Bechtel National Inc. (BNI), whenever possible.

Section 3
Site Work

This section describes the field activities performed to accomplish the scope of work. Site 9 field activities preceded Site 2 field activities. The temporary LLRM storage area was constructed following the excavation of LLRM at Sites 2 and 9.

The major work elements included the following:

- Clearing and grubbing
- Surface scan and LLRM excavation
- Confirmation sampling
- Disposal characterization of the LLRM stockpile
- Air monitoring
- Postexcavation surface scan
- LLRM packaging and handling
- Setup of temporary LLRM storage area
- Backfill and compaction
- Site restoration.

The following sections detail how the major work elements were completed.

3.1 Clearing and Grubbing

Site 2 – Site 2 is a former landfill facility with minimal vegetative cover and, thus, required minimal clearing and grubbing. Prior to excavation activities, plastic sheeting covering the excavation area had to be removed. The sheeting was assumed to have been placed to minimize surface erosion from rainfall. At the completion of the excavation activities, the sheeting was disposed of in the rolloff bins with the LLRM.

Site 9 – Prior to excavation activities at Site 9, the existing chain-link fencing that delineated the former LLRW storage area (Area 7) was dismantled. The fence fabric and posts were first scanned for LLRM. The results were below the action level. The fabric was then cut from the fence and the posts were pulled from the ground using a backhoe. The fencing was stockpiled in a corner of the CAA for subsequent disposal.

Following removal of fencing, the vegetative cover (primarily ice plant) was removed from the excavation area and stockpiled. Underneath the vegetative cover, steel plates and matting (average dimensions of 3 by 3 feet, by ¼ inch thick) were found scattered in the excavation

area. The plates were removed and stockpiled. The vegetative cover and steel matting were screened for LLRM. The results were below the action level.

During removal of the vegetation and steel plates, pin flags (36-inch centers) were discovered delineating the sampling grid from the previous investigation by Jacobs Engineering Group Inc. (Jacobs, 1995). This grid was used for the initial surface scan in order to correlate the new data with the previous grid data shown in Figure 1-4 of the work plan (OHM, 1998).

At the completion of excavation activities, the ice plant grub was spread out and tilled into the nearby hillside. The fence fabric and posts were disposed of at the NAS North Island Recycling Center. The metal plates were placed nearby where other similar plates were located.

3.2 Surface Scan and LLRM Excavation

A radiological gamma scan was performed on the original ground surface at each site prior to removing any soil. The purpose of the scan was to locate point-source hot spots and to remove them. The surface scan procedures described in Section 4.4 of the work plan (OHM, 1998) were successfully implemented for Site 9. However, the distribution of the LLRM was different than expected at Site 2. Consequently, the surface scan at Site 2 was used to identify contaminated areas to be excavated and to help establish the outer lateral boundaries of the excavation, rather than just for hot spot removal.

The surface scan at each site was conducted as described in the following paragraphs.

Site 2 – A 3- by 3-foot grid square system was established at Site 2 for the proposed area of excavation identified in Figure 1-3 of the work plan (OHM, 1998). Previous documentation did not precisely delineate the removal area; however, the area was estimated as approximately 125 square feet in the work plan. The background activity of Site 2 ranged between 9,000 and 11,000 cpm. An approximate correlation between the units of measurement for the NaI detector (cpm) and the HPGe (pCi/g) is presented in Appendix D.

The initial surface scan was conducted on December 8, 1998. The RCT began a surface scan of the original ground surface to document initial conditions and to locate hot spots for removal (Appendix A, Photograph 1). The surface scan indicated that the contaminated area was larger than the estimated area of 125 square feet. The maximum activity level measured during the surface scan was 275,000 cpm. As the field crew began hand digging, the activity levels increased with depth. To confirm this, a test pit was hand augered and samples were collected every 6 inches to a depth of 2 feet below grade to assess the vertical profile of radioactivity. The results, presented in Table 1 as Test Pit, indicated that three of the samples exceeded the 5 pCi/g action level, and the first surface sample had an activity of 1.1 pCi/g. The location of the test pit is shown in Figure 3.

The high activity levels measured from the surface scan and the test pit indicated that *in situ* soil radioactivity was much higher than the action level of 5 pCi/g. Therefore, it was not necessary to collect and analyze confirmation samples at intervals of 6 inches, as specified in

the work plan (OHM, 1998), because the LLRM could be removed with the backhoe while continuously scanning the soil with a sodium iodide (NaI) detector (Appendix A, Photograph 2). Confirmation samples only needed to be collected at the 18- to 24-inch lift, as discussed in Section 3.3.

Observation of the soil collected from the test pit and at the excavation sidewalls indicated that the LLRM apparently was a continuous horizontal layer of dark slag and cinder ash (Appendix A, Photograph 4) extending under the landfill cap. In general, the top of the LLRM layer was covered by more than 2 feet of soil at the top of slope but by less than 1 foot at the toe of slope (Appendix A, Photograph 7). Therefore, the excavation extended into the face of the slope until the top of the LLRM-contaminated slag lens was observed to be extending horizontally under the landfill cap, with a minimum cover of 2 feet (Appendix A, Photograph No. 3).

In accordance with the work plan (OHM, 1998), the maximum excavation depth was established at 2 feet below ground surface. However, because of the thickness of the lens, the LLRM layer extended more than 2 feet below ground surface. Therefore, LLRM was left in place below 2 feet. The activity levels of the LLRM left in place is discussed in Section 3. The outer limit of the excavation was delineated by collecting 12 borehole samples to a depth of 2 feet below grade around the perimeter of the excavation. The locations of the borehole samples are shown in Figure 4, and the results are presented in Table 1.

The work plan (OHM, 1998) also identified a point source at Site 2, suspected to be a luminescent device, near Tow Way Road. The RCT found the point source at 18 inches below ground surface and removed it. A confirmation soil sample (22A) collected below the removal of the point source had an activity level of 1.4 pCi/g. The location from which the point source was removed is shown in Figure 3.

Site 9 – Before beginning the surface scan at Site 9, a 3- by 3-foot grid square system was delineated over the proposed excavation footprint. As discussed in Section 3.1, the previous grid system established during the site assessment (Jacobs, 1995) was used. However, during the initial scan, LLRM was detected around some fence post holes. Therefore, the grid was extended toward the north, to encompass the area where the fence posts had been removed. The revised grid area was approximately 45 by 45 feet, as shown in Figure 5. With the grid system in place, the RCT walked slowly through each grid square while passing the NaI detector across the ground surface. The RCT recorded the count rate within each grid square. In addition, the RCT investigated any location where the count rate exceeded two times background. At this site, background was measured at 6,000 to 7,000 cpm. A reading of 14,000 cpm or more was considered a hot spot and was cause for further investigation.

The initial surface scan determined that 42 of the 196 grid squares had measured activities greater than two times background. The RCT returned to each potential hot spot location and attempted to find a point source responsible for the elevated reading. If a point source was found, it was removed using a hand trowel and the location was rescanned. The point source was usually a visible object. However, occasionally no object was found, but the elevated readings stopped after the removal of several scoops of soil. The hot spot point sources typically were found in the upper 1 foot of soil. The deepest hot spot point source was 2 feet

below ground surface. Point sources included small unidentifiable metal fragments, glass bottle fragments, unidentifiable clods, and loose soil. The removed point sources were bagged and placed in the LLRM stockpile. One cesium-137 point source was found. It was segregated from the LLRM stockpile soil, as requested by the Navy, placed in a 30-gallon drum, and transported to the temporary LLRM storage area.

After the point sources were removed, elevated readings (i.e., more than two times background) still persisted in many of the grid squares. Isolated grid squares were excavated manually to a depth of 6 inches below ground surface. A backhoe was used to excavate a cluster of grid squares (approximately 15 by 15 feet) to a depth of 6 inches below ground surface in the northeast corner of the site. Approximately 5 yd^3 of soil was removed and placed into the LLRM stockpile.

3.3 Confirmation Sampling

Following completion of the surface scan at each site, the grids were modified to approximately 15- by 15-foot grid cells. Samples were then collected from each grid cell and composited for analysis by the HPGe to determine the activity of the soil. Table 2 lists the activities of all samples counted by the HPGe.

Site 2 – Because of the geometry of the Site 2 excavation area and the continuous nature of LLRM, confirmation sampling at Site 2 was limited. Confirmation samples analyzed by the HPGe were primarily used to delineate the lateral limits of LLRM exceeding 5 pCi/g. This was accomplished by collecting and analyzing soil samples from 12 hand-augered boreholes at various depths around the perimeter of the excavation. Because of the geometry of the boreholes and the background interference, it was not possible to correlate the NaI detector readings in the borehole with the HPGe readings. The boreholes were logged with the NaI detector at 6-inch-depth increments. Seven of the boreholes were sampled and counted in the HPGe. The borehole locations are plotted in Figure 4. The results of the borehole logging (NaI detector) and borehole soil samples (HPGe) are presented in Table 1.

In addition to borehole sampling, confirmation samples were collected from the 18- to 24-inches below ground surface lift in grid cells B1 and C1. Lifts 1 through 4 in the other grid cells had previously been removed during the surface scan excavation. The two samples were composited (sample 35A) and analyzed by the HPGe. The radium-226 activity in sample 35A was 9.4 pCi/g, which exceeds the 5 pCi/g action level; therefore, a 6-inch layer of soil was removed and added to the LLRM stockpile.

Site 9 – Subsequent to the surface scan and removal of hot spots at Site 9, the pin flags that delineated the surface scan grid (3-foot squares) were removed. The 45- by 45-foot excavation area was then modified to a 15- by 15-foot grid cell system, resulting in nine grid cells. The area was then divided into 6-inch vertical lifts to 2 feet below ground surface, for a total of four lifts. For each 6-inch lift, a soil sample was collected from the center of each of the nine cells. The nine samples were then composited into one sample to represent the entire volume for the given lift. This sampling approach resulted in four composited samples, one for each lift at 0 to 6, 6 to 12, 12 to 18, and 18 to 24 inches below ground

surface. The four composite samples were each analyzed by the HPGe for radium-226 and cesium-137. If the concentration of the composite sample was less than 5 pCi/g, the lift was placed in the nonimpacted ("clean") stockpile. If the concentration of the composite sample was greater than 5 pCi/g, the lift was placed in the LLRM stockpile. The results of the confirmation composite samples are presented in Table 3.

Based on the analytical results, all the 6-inch lifts were excavated and placed in the "clean" stockpile. Therefore, the only LLRM removed from the area was during the initial surface scan removal effort, which resulted in a total volume of approximately 5 yd^3.

3.4 Stockpile Sampling

The LLRM stockpile at each site was sampled in accordance with the procedures described in Section 2.3 of Appendix B in the work plan (OHM, 1998). The stockpile samples were submitted to Data Chem Laboratories, an approved mixed waste analytical laboratory. The samples were analyzed for volatile organic compounds, semivolatile organic compounds, and Title 22 metals. The purpose of these analyses was to provide chemical constituent information that will be needed by the Navy when arranging for final disposal of the LLRM. The analytical results are presented in Appendix B. The clean stockpiles were not sampled for the specified constituents because the soil was used as backfill material and not disposed of off site.

Site 2 – The volume of the LLRM stockpile at Site 2 was calculated by field measurements to be approximately 70 yd^3. In accordance with the *Site Assessment and Mitigation (SAM) Manual* (San Diego County, Department of Environmental Health [DEH], 1998), four samples were required to characterize this volume of soil. OHM collected four discreet samples, plus one duplicate sample required for quality control checking. Each discreet sample was collected from a different face of the stockpile.

Site 9 – The stockpile volume at Site 9 was approximately 5 yd^3. In accordance with the *SAM Manual* (DEH, 1998), two samples were required for the given volume. OHM collected two discreet samples and one duplicate sample. The two discreet samples were collected from opposite faces of the stockpile.

3.5 Air Monitoring

OHM conducted real-time air monitoring for radioactive and nonradioactive particulates (dust monitoring) and organic vapors (gas monitoring) at the downwind side of the work site, as specified in Section 7 of Appendix D of the work plan (OHM, 1998). The measurements indicated that at no time did nonradioactive dust exceed the action level of 1.0 milligrams per cubic meter (mg/m^3) or organic vapors exceed the action level of 10 parts per million (ppm). The HPGe results indicated that radioactive dust in the air did not exceed the action level of $1x10^{-10}$ microcuries per milliliter (µCi/ml) (gross alpha), as specified in Section 7.3 of Appendix D of the work plan (OHM, 1998). The monitoring logs are stored in the permanent project file.

A second-party company also conducted perimeter air monitoring during excavation activities at both sites. The objective of the monitoring was to measure and report all radiological particulates migrating off the project sites. This activity was conducted by Radian International under an existing contract with the Navy. The analytical results indicated that airborne concentrations of cesium-137 and radium-226 did not exceed the effluent concentration limits established in Appendix B of 10 CFR 20. Those limits are $2x10^{-10}$ µCi/ml for cesium-137 and $9x10^{-13}$ µCi/ml for radium-226. The air monitoring report is presented in Appendix C.

3.6 Postexcavation Surface Scan

In accordance with Section 4.5 of the work plan (OHM, 1998), a postexcavation (final) surface scan was performed at both sites to document radioactivity levels left in place, if any, prior to site restoration activities.

Site 2 – At the completion of excavation work at Site 2, a final surface scan was conducted on December 15, 1998, at the bottom of the excavated area. The excavation footprint, as outlined in Figure 3, was approximately 850 square feet. Figure 4 illustrates the scan results using the 3- by 3-foot grid square system. The highest reading was 50,000 cpm.

A meeting was held at the site on December 16, 1998, to notify the Navy that LLRM was still present at 2 feet below ground surface. The meeting was attended by Richard Mach, Jr. (Navy Remedial Project Manager), Lieutenant Commander Vincent DeInnocentis (Radiological Affairs Support Office), Mike Abel (OHM), and Anthony Martinez (OHM). After reviewing the work plan, it was decided to collect and analyze eight additional samples (six at the 2-foot floor and two at the sidewalls), prior to fill placement, to further document radiological contamination left in place. Grab sample locations (#1 through #8) are shown in Figure 4. Sample results are presented in Table 4.

Three of the six floor samples collected from the bottom of the excavation exceeded the action level of 5 pCi/g for LLRM. The two sidewall samples were purposely collected from the LLRM-contaminated slag lens in order to document the suspected highest activity left in place. The lateral and vertical extent of the horizontal slag lens under the landfill cap is unknown. After analysis of the samples, the excavation was backfilled.

Site 9 – The completed excavation at Site 9 was 45 by 45 feet, by 2 feet deep. On December 12, 1998, prior to fill placement and compaction, a final surface scan was conducted using the NaI detector. The results were plotted using the original grid with 3-foot spacings and are shown in Figure 6. The locations were within the background range (6,000 to 7,000 cpm) with the exception of one location in the northern area of grid cell C-2, which registered 8,800 cpm. Although this was slightly higher than background, it was still well below the action level of 5 pCi/g. Therefore, no further action was required for the soil associated with this sample.

3.7 LLRM Packaging and Handling

Subsequent to excavation activities and stockpile sampling, an LLRM packaging and handling area was set up at each site. The size of the area depended on the volume of soil in the LLRM stockpile.

Site 2 – As a result of the unexpectedly large volume of soil in the LLRM stockpile, it was decided that using 55-gallon drums for storage would be labor intensive and costly. As an alternative, and with the permission of the Navy, the soil was stored in 15-yd^3 covered rolloff bins. The rolloff bins were placed on plastic sheeting directly next to the LLRM stockpile and were loaded using a front-end loader. Five rolloff bins were filled at Site 2. After each rolloff bin was filled and the cover was sealed, the bin was transported to the temporary LLRM storage area (shown on the traffic plan in Figure 4-2 of the work plan [OHM, 1998]). The rolloff bins were transported by MP Environmental, Inc., a licensed hazardous waste hauler. After all the stockpiled soil had been placed into the rolloff bins, the plastic berm lining was removed and deposited into the fifth rolloff bin. The ground surface underneath the plastic was scanned to verify that no soil had spilled from the LLRM stockpile.

Site 9 – The packaging and handling area at Site 9 was constructed in accordance with Section 4.3.3 of the work plan (OHM, 1998). The packaging and handling area was set up next to the LLRM stockpile because of the small volume of soil (5 yd^3). A backhoe was used to load the LLRM into 55-gallon steel drums. As each drum was filled, it was moved to the corner of the packaging and handling area and the process was repeated for the next drum. A total of 19 drums were filled with LLRM at Site 9. Some of the drums included plastic berm lining and personal protective equipment (PPE). An additional drum, 30-gallon size, was used to contain the single cesium-137 object. The drums were then moved approximately 200 feet to the temporary LLRM storage area.

IR Site 10 – One 30-gallon sealed steel drum was received from IR Site 10 and was placed in the Site 9 temporary storage area. The drum contained small metal fragments and other objects that had been removed from the shoreline at Site 10 during a radiological survey. The approximate volume of LLRM in the drum is 0.2 cubic foot.

3.8 Temporary LLRM Storage Area

OHM constructed a temporary LLRM storage area for the packaged LLRM. The temporary LLRM storage area is situated in the vicinity of the Site 9 excavation area, as shown in Figure 5. The location is in a remote, isolated section of NAS North Island, with restricted access. The temporary LLRM storage area is surrounded by a chain-link fence, with a locked gate and appropriate signage. The main sign bears the purple radiation symbol and reads, “Caution: Radioactive Materials.”

Dose rates and smear samples were taken on the drums and bins brought to the temporary LLRM storage area. The dose rates provided general information on the activity emitted by the containers for posting proper signage and for documentation purposes. The smear samples were intended to catch any loose LLRM that might be clinging to the outside of the

containers. The smear sample dose rates are presented in Table 5. The smear sample results indicated that no LLRM was on the outside of the drums or bins.

As stated in the work plan (OHM, 1998), the Navy will assume custody of the temporary LLRM storage area and be responsible for the ongoing activities associated with managing the container inventory. The temporary LLRM storage area established during this removal action should not be confused with the former LLRW storage area (Area 7), which was the excavated area at Site 9, as shown in Figure 5.

LLRM Inventory Log – Pertinent data for the LLRM drums and rolloff bins are presented in Table 5, including a description of the contents of each container. The project generated 20 drums from Site 9, 1 drum from Site 10, and 5 rolloff bins from Site 2. Each container is marked with a bin/drum number so that it can be cross-referenced with the drum inventory log.

3.9 Backfill and Compaction

Prior to fill placement and compaction, the topography and sample locations were surveyed and recorded by a California-registered land surveyor. Each area was then backfilled and graded to the approximate preexcavation topography.

Site 2 – The excavation was backfilled with sand obtained from the Eel Grass Mitigation Stockpile at the northwest shore of NAS North Island. The backfill was scanned upon delivery and was determined to be less than or equal to background activity levels. Backfill was placed in loose lifts, approximately 6 to 12 inches thick. The fill was compacted by mechanical equipment to a minimum of 90 percent of maximum dry density, as determined by the American Society for Testing and Materials Method D 1557, and was tested by a geotechnical engineering contractor.

Site 9 – The "clean" stockpile was used to refill the 2-foot-deep excavation. No additional import soil was needed. Fill placement and compaction were accomplished using a front-end loader. The stockpile soil was placed in several lifts; each loose lift was moisture conditioned by a sprayer hose and compacted by wheel rolling. No density or moisture content requirements were specified for the fill and, thus, no compaction testing was done.

3.10 Site Restoration

All temporary fencing, stockpiles, construction debris, and other evidence of the construction project were removed or cleaned up. There were no preexisting site features such as utilities or sidewalks requiring restoration.

3.11 Equipment Decontamination

The RCT surveyed the heavy equipment and hand tools used to excavate the LLRM before being brought into the CAA and prior to leaving the CAA to make sure that no contamination

was brought into the work area and that no LLRM left the work area clinging to the equipment.

Section 4
Findings, Conclusions, and Recommendations

The objective of the TCRA was to reduce risk to human health and the environment. This was accomplished by mitigating low-level radioactive contaminated areas to comply with 40 CFR 192 and EPA Memorandum 9200.4-18. The regulations require remediation of radium-226 contamination to 5 pCi/g in the first 15 centimeters (6 inches) of soil and to 15 pCi/g in the subsequent 15 centimeters of soil. The scope of the removal was based on reducing the potential for exposure of ecological and human receptors.

Sections 4.1 and 4.2 present the findings, conclusions, and recommendations for Sites 2 and 9 based on the results of the site work discussed in Section 3.

4.1 Findings and Conclusions

The TCRA was completed as specified in the work plan (OHM, 1998). The following paragraphs discuss the findings and conclusions of the removal action at each site.

Site 2 – The removal action at Site 2 resulted in the removal of approximately 70 yd^3 of LLRM, which was subsequently placed into five covered 15-yd^3 rolloff bins for storage at the temporary LLRM storage area. The work plan (OHM, 1998) estimated that approximately 450 cubic feet (16.6 yd^3) would require removal. This difference in volume is due to the fact that the LLRM was not loosely dispersed in the soil as suspected, but rather was concentrated in a lens of slag and cinder ash.

The work plan (OHM, 1998) specified that the excavation would not exceed 2 feet below ground surface, at which point a final surface scan would be conducted to document any LLRM left in place. As shown in Figure 4, LLRM was left in place at 2 feet below ground surface and along the southern wall of the excavation in the cut face of the landfill cap. The LLRM left in place exceeds the action level of 5 pCi/g, with activity levels ranging from 6.0 to 663.6 pCi/g.

The following observations were made during the TCRA at Site 2:

- The LLRM appeared to originate from a dark lens of slag/ash that extends under the landfill cap. The extent of the lens under the landfill cap is unknown.
- The only contaminant detected was radium-226. A maximum activity of 92.9 pCi/g was detected in the soil samples collected from the excavated soil.
- An isolated point source of radium-226 was encountered at 18 inches below ground surface near Tow Way Road. The point source was removed. A soil confirmation sample indicated that the subsequent activity level at that location was less than the established background level.

Subsequent to the postexcavation surface scan, the excavation was backfilled with noncontaminated soil and compacted. It is OHM's understanding that the Navy intends to pave the landfill area.

Site 9 – The TCRA at Site 9 resulted in the removal of approximately 5 yd^3 of LLRM, which was subsequently placed into nineteen 55-gallon steel drums and one 30-gallon steel drum for storage at the temporary LLRM storage area. The LLRM was loosely dispersed throughout the soil, as indicated in the work plan (OHM, 1998). The postexcavation surface scan indicated that no LLRM left in place at 2 feet below ground surface exceeded the action level of 5 pCi/g.

The following observations were made during the TCRA at Site 9:

- The majority of LLRM was present in the upper 6-inch layer of soil in the northeast quadrant of the excavation area.
- The maximum activity levels detected in the excavated soil at the site were 68.4 pCi/g as radium-226 and 3.9 pCi/g as cesium-137.
- Soil and point sources were contaminated with radium-226, except for one point source, which was contaminated with cesium-137. As requested by the Navy, the cesium-137 was packaged separate from the radium-226.
- The TCRA succeeded in removing the LLRM in accordance with the project work plan (OHM, 1998). The surface scan of the bottom of the excavation indicated that remaining on-site radioactivity was at or near background levels.

LLRM Storage Area – The 21 drums and 5 rolloff bins are properly labeled and stored, according to regulations, in the temporary LLRM storage area situated at Site 9. It is OHM's understanding that the Navy plans to dispose of the containers under a contract with the Army.

Risk Reduction – As discussed, all known LLRM has been removed from Site 9 at Area 7, and surface/near-surface LLRM has been removed from the area of concern at Site 2. Therefore, the TCRA eliminated the identified exposure pathway to the low-level radioactively contaminated materials at Sites 2 and 9.

4.2 Recommendations

Based on the conclusions presented in Section 4.2, OHM recommends the following actions for each site:

Site 2

- Pave the landfill surface, the north corner slope area, and the access road (on the northwest side) with concrete or asphaltic concrete.
- Maintain the pavement in good condition.

- Do not excavate or disturb the site without first obtaining a radiological assessment.
- In areas that are not paved, maintain the integrity of the landfill cap and prevent surface erosion due to runoff.

After implementation of the above recommendations, it is recommended that the Navy request site closure with respect to LLRM, with restricted future land use.

Site 9

- Request site closure with respect to LLRM at Area 7 at Site 9.

Section 5
References

DEH, see San Diego County, Department of Environmental Health.

EPA, see U.S. Environmental Protection Agency.

Jacobs, see Jacobs Engineering Group Inc.

Jacobs Engineering Group Inc., 1995, *Remedial Investigation/RCRA Facility Investigation Report, Site 9, Chemical Waste Disposal Area, NAS North Island, Coronado, California,* Volume I, DCN CLE-J02-01F216-B7-0001, September 22.

OHM, see OHM Remediation Services Corp.

OHM Remediation Services Corp., 1998, *Removal Action Work Plan, Time-Critical Removal Action, Low-Level Radioactive Material Removal Action, Installation Restoration Sites 2 and 9, NAS North Island, Coronado, California,* Document SW5070, Revision 0, July 27.

San Diego County, Department of Environmental Health, 1998, *Site Assessment and Mitigation Manual*.

U.S. Environmental Protection Agency, 1998, *Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites,* Memorandum Directive No. 9200.4-18, February 12.

U.S. Environmental Protection Agency, Title 40, Code of Federal Regulations, Part 192, *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings.*

Tables

Table 1
Site 2 Borehole Sampling Results

Borehole	Sample Depth (inches bgs)	NaI Detector Reading (cpm)	Sample Number	HPGe Reading (pCi/g)
Test Pit	0-6	90,000	20A	1.1
	6-12	220,000	19A	**13.6**
	12-18	360,000	21A	**176.6**
	18-24	250,000	17A	**54.7**
SB-1	surface	13,000		NS
	0-6	7,000		NS
	6-12	19,000		NS
	12-18	22,000		NS
	18-24	33,000	30A	2.3
SB-2	surface	15,000		NS
	0-6	21,000		NS
SB-3	surface	13,000		NS
	0-6	13,000		NS
	6-12	12,000		NS
SB-4	surface	11,000		NS
	0-6	13,000		NS
	6-12	13,000		NS
	12-18	14,000		NS
	18-24	20,000		NS
SB-5	surface	12,000		NS
	0-6	13,000		NS
	6-12	13,000		NS
	12-18	12,000		NS
	18-24	14,000		NS
SB-6	surface	11,000		NS
	0-6	19,000		NS
	6-12	22,000		NS
	12-18	49,000	28A	1.2
	18-24	124,000	29A	**11.5**
SB-7	surface	10,000		NS
	0-6	12,000		NS
	6-12	14,000		NS
	12-18	13,000		NS
	18-24	13,000		NS
SB-8	surface	11,000		NS
	0-6	14,000		NS
	6-12	25,000		NS
	12-18	36,000	34A	4.6
	18-24	48,000	33A	**16.5**
SB-9	surface	10,000		NS
	0-6	13,000		NS
	6-12	12,000		NS
	12-18	12,000		NS

Table 1 (Continued)
Site 2 Borehole Sampling Results

Borehole	Sample Depth (inches bgs)	NaI Detector Reading (cpm)	Sample Number	HPGe Reading (pCi/g)
SB-10	surface	11,000		NS
	0-6	11,000		NS
	6-12	11,000		NS
	12-18	13,000		NS
SB-11	Surface	10,000		NS
	0-6	14,000		NS
	6-12	16,000		NS
	12-18	16,000		NS
SB-12	surface	11,000		NS
	0-6	12,000		NS
	6-12	16,000		NS
	12-18	19,000	31A	1.5
	18-24	24,000	32A	2.0

boldface *- Sample activity exceeded action level.*

bgs – below ground surface
cpm – counts per minute
NS – not sampled
pCi/g – picocuries per gram

Table 2
HPGe Soil Sample Log Summary

The table (on next page) presents data from the on-site laboratory for both Sites 2 and 9.

A total of 52 soil samples were collected. The samples were analyzed as follows:

- A high-density geranium (HPGe) spectrometer was used to measure the radioactivity count for 44 samples.
- Of the 44 samples counted, 6 were submitted to a off-site laboratory, Data Chem Laboratories, to confirm the accuracy of the on-site HPGe.
- In addition, 8 stockpile samples were submitted for chemical analysis at Data Chem Laboratories for disposal characterization.

Appendix B presents analytical reports from the off-site laboratory.

HPGe Soil Sample Log Summary

SAMPLE ID	DATED COUNTED	Ra-226 pCi/g	Cs-137 pCi/g	Comments
20603-001A Site 9 Grab sample H-4 3'x3'	12/4/98	4.5	.08	0"-6" 14K to 16K cpm 3'x3' grid
20603-002A Site 9 Grab sample J-6 3'x3'	12/4/98	1.0	.01	17K cpm 3'x3' grid
20603-003A Site 9 Grab sample K-5 3'x3'	12/4/98	1.1	.05	19K to 22K cpm 3'x3' grid
20603-004A Site 9 Grab sample A-5 3'x3'	12/7/98	.71	.04	18K cpm Approx. 2' 3'x3' grid
20603-005A Site 9 Composite Confirmation 0"-6"	12/7/98	1.8	.07	Composite 0"-6" Sent for off-site analysis
20603-006A Sample #1 Grab composite sample stockpile	12/7/98	68.4	2.5	Site 9 Stockpile
20603-007A Sample #2 Grab composite sample Stockpile	12/7/98	48.8	3.9	Site 9 Stockpile Sent for off-site analysis
20603-001A Site 9 Grab sample H-4 3'x3'	12/7/98	5.3	.04	Recount
20603-008A Site 9 Composite Confirmation 6"-12"	12/7/98	1.3	.03	Composite 6"-12"
20603-009A Site 9 Composite Confirmation 12"-18"	12/8/98	.30	.02	Composite 12"-18"
20603-013A Site 9 Composite Confirmation 18"-24"	12/8/98	1.4	.02	Composidste 18"-24"
20603-005A Site 9 Composite Confirmation	12/9/98	1.7	.06	Recount 0"-6"
20603-008A Site 9 Composite Confirmation	12/9/98	1.3	.03	Recount 6"-12"
20603-009A Site 9 Composite Confirmation	12/9/98	.35	02	Recount 12"-18"
20603-010 – 012A Sample numbers use for Off-Site analysis				
20603-013A Site 9 Composite Confirmation	12/9/98	1.1	.02	Recount 18"-24"

HPGe Soil Sample Log Summary

SAMPLE ID	DATED COUNTED	Ra-226 pCi/g	Cs-137 pCi/g	Comments
20603-014A Site 2 Grab sample H-8 3'x3'	12/9/98	12.3	.02	Approx. 18" depth 3'x3' grid
20603-015A Site 2 Grab sample H-8 3'x3'	12/9/98	12.9	.30	6"-12" on the side 3'x3' grid
20603-016A Site 2 Test Pit #1 SW corner 24"-30"	12/10/98	92.9	.24	235,000 cpm
20603-017A Site 2 Test Pit #1 SW corner 18"-24"	12/10/98	54.7	.18	250,000 cpm
20603-018A Site 2 Test Pit #2 Bottom 12"-18"	12/10/98	.57	.03	35,000 cpm looks like shine from other sources.
20603-019A Site 2 Test Pit #1 SW corner 6"-12"	12/10/98	13.6	.09	220,000 cpm reading shine from lower depths
20603-020A Site 2 Test Pit #1 SW corner 0"-6"	12/10/98	1.1	.02	90,000 cpm reading shine from lower depths
20603-021A Site 2 Test Pit #1 SW corner 12"-18"	12/10/98	176.6	.33	360,000 cpm
20603-022A Site 2 Point Source Area Next to Tow Street	12/10/98	1.4	.02	Confirmation that point source was cleaned up.
20603-023A Site 2 Grab Sample #1 6"-12" North	12/10/98	6.1	.05	27,000 cpm used to determine extent of contamination
20603-024A Site 2 Grab Sample #3 6"-12" North Fence	12/10/98	1.0	.02	31,000 cpm used to determine extent of contamination
20603-025A Site 2 Grab Sample #2 0"-6" North Fence	12/11/98	5.5	05	25,000 cpm used to determine extent of contamination
20603-026A Site 2 Grab Sample #4 6"-12" Northeast	12/11/98	27.7	.12	27,000 cpm used to determine extent of contamination

HPGe Soil Sample Log Summary

SAMPLE ID	DATED COUNTED	Ra-226 pCi/g	Cs-137 pCi/g	Comments
20603-027A Site 2 Grab Sample 0"-6" Westside	12/11/98	3.9	.03	20,000 cpm used to determine extent of contamination
20603-028A Site 2 Bore Hole #6 12"- 18"	12/11/98	1.2	.01	12"-22K cpm – 18" 49K cpm
20603-029A Site 2 Bore Hole #6 18"- 24"	12/11/98	11.5	.08	18" – 49K cpm
20603-030A Site 2 Bore Hole #1 18"- 24"	12/11/98	2.3	.02	18"- 22K cpm – 24"- 33K cpm
20603-031A Site 2 Bore Hole #12 12"- 18"	12/14/98	1.5	.01	12"- 16K cpm – 18"- 19K cpm
20603-032A Site 2 Bore Hole #12 18"- 24"	12/14/98	2.0	.02	18"- 19K cpm – 24"-24K cpm
20603-033A Site 2 Bore Hole #8 18"- 24"	12/14/98	16.5	.03	18"- 36K cpm
20603-034A Site 2 Bore Hole #8 12"- 18"	12/14/98	4.6	.04	12"- 25K cpm – 18"- 36K cpm
20603-035A Site 2 Composite Confirmation 18"- 24"	12/15/98	9.4	.03	Composite Confirmation 18"- 24" sent to off –site lab for analysis
20603-036A Site 2 Stockpile Composite #1	12/15/98	46.8	.15	Stockpile Composite #1
20603-037A Site 2 Stockpile Composite #2	12/15/98	75.4	.20	Stockpile Composite #2
20603-038A Site 2 Stockpile Composite #3	12/16/98	8.4	.08	Stockpile Composite #3
20603-039A Site 2 Stockpile Composite #4	12/16/98	15.3	.10	Stockpile Composite #4
20603-040 – 044A Sample numbers used for off-site sample analysis				
20603-045A Site 2 Grab sample B-1 11K cpm	12/17/98	1.0	.01	Grid B-1 of 15'x 15' 11K cpm Used to determine left in place activity.
20603-046A Site 2 Grab sample C-2 28K cpm	12/17/98	8.2	.03	Grid C-2 of 15'x 15' 28K cpm Used to determine left in place activity

HPGe Soil Sample Log Summary

SAMPLE ID	DATED COUNTED	Ra-226 pCi/g	Cs-137 pCi/g	Comments
20603-047A Site 2 Grab sample B-2 22K cpm	12/17/98	2.5	.03	Grid B-2 15'x 15' 22K cpm Used to determine left in place activity
20603-048A Site 2 Grab sample C-1 18K cpm	12/17/98	1.2	.01	Grid C-1 15'x 15' 18K cpm Used to determine left in place activity
20603-049A Site 2 Grab sample C-2 115K cpm Embankment	12/17/98	663.6	.56	Grid C-2 15'x 15' 115K cpm Embankment, used to determine left in place activity
20603-050A Site 2 Grab sample A-3 50K cpm	12/17/98	21.5	.05	Grid A-3 15'x 15' 50K cpm Used to determine left in place activity
20603-051A Site 2 Grab sample B-3 102K cpm Embankment	12/17/98	16.7	.11	Grid B-3 15'x 15' 102K cpm Embankment, used to determine left in place activity
20603-052A Site 2 Grab sample A-2 38K cpm	12/17/98	6.0	.02	Grid A-2 15'x 15' 38K cpm Used to determine left in place activity

Table 3
Site 9 Confirmation Sampling Results

Lift (inches bgs)	Sample Number	Action Level (pCi/g)	Radium-226 (pCi/g)	Cesium-137 (pCi/g)
0-6	5A	5	1.8 (1.7)*	0.07 (0.06)[a]
6-12	8A		1.3 (1.3)	0.03 (0.03)
	9A	5		0.02 (0.02)
18-24		5	1.4 (1.1)	

( ) Results of duplicate analysis.
[a]Sent for off-site verification analysis in accordance with the work plan (OHM, 1998).

bgs – below ground surface
pCi/g – picocuries per gram

Table 4
Site 2 Postexcavation Sampling Results

Sample ID	Sample Number	Location	Depth (inches bgs)	NaI Detector Reading (cpm)	HPGe Reading (pCi/g)
1	50A	bottom of excavation, grid cell A3	24-30[a]	50,000	**21.5**
2	52A	bottom of excavation, grid cell A2	24-30[a]	38,000	**6.0**
3	47A	bottom of excavation, grid cell B2	24-30[a]	22,000	2.5
4	45A	bottom of excavation, grid cell B1	24-30[a]	11,000	1.0
5	48A	bottom of excavation, grid cell C1	24-30[a]	18,000	1.2
6	49A	bottom of excavation, grid cell C2	24-30[a]	28,000	**8.2**
7	51A	sidewall at toe of slope, grid cell B3	18[b]	102,000	**16.7**
8	46A	sidewall at toe of slope, grid cell C2	18[b]	115,000	**663.6**

boldface *- Sample activity exceeded action level.*
[a] Depth below original ground surface.
[b] Depth below toe of slope; however, sample was taken laterally into face of cut slope. Estimated depth is 2 feet bgs relative to original slope surface.

bgs – below ground surface *cpm – counts per minute* *pCi/g – picocuries per gram*

Table 5
LLRM Inventory Log

The log (on next page) documents all containerized materials at the temporary LLRM storage area at Site 9.

LLRM Inventory Log
SWDIV RAC Contract No. N68711-93-D-1459, DO 123
Naval Air Station North Island (NASNI)
Installation Restoration (IR) Sites 2 and 9

Drum /Bin #	Date Filled	Size	Matrix	Contents Description	Dose Rate[5] (µrem/hr)	Label(s)[6]	See Note
1	11/20/98	30 gal	mixed	Sand and small metallic debris. Total volume approximately 1/6 cubic foot in an inner plastic bucket. See chain of custody 208400 for more information. From Site 10.	40	Caution Radioactive Material Hazardous Waste (with detail data) Drum Number	1
2	12/16/98	55 gal	mixed	Black plastic sheeting with wet clinging soil. From bermed area at Site 9.	14	Caution Radioactive Material Contents: Soil & Plastic Sheeting Drum Number & Date Filled	2
3	12/16/98	55 gal	mixed	Soil, PPE, and plastic sheeting. About ½ is soil and the rest is PPE & sheeting.	13	Caution Radioactive Material Contents: Soil & PPE Drum Number & Date Filled	2
4	12/15/98	55 gal	mixed	Soil and PPE. About ¾ is soil, the balance is PPE.	11	Caution Radioactive Material Contents: Soil & PPE Drum Number & Date Filled	2
5	12/15/98	55 gal	mixed	Soil and PPE.	16	Caution Radioactive Material Contents: Soil & PPE Drum Number & Date Filled	2
6	12/15/98	55 gal	soil	Soil from Site 9.	30	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
7	12/15/98	55 gal	soil	Soil from Site 9.	20	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
8	12/15/98	55 gal	soil	Soil from Site 9.	30	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
9	12/15/98	55 gal	soil	Soil from Site 9.	24	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2

LLRM Inventory Log
SWDIV RAC Contract No. N68711-93-D-1459, DO 123
Naval Air Station North Island (NASNI)
Installation Restoration (IR) Sites 2 and 9

Drum /Bin #	Date Filled	Size	Matrix	Contents Description	Dose Rate[5] (µrem/hr)	Label(s)[6]	See Note
10	12/15/98	55 gal	soil	Soil from Site 9.	18	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
11	12/15/98	55 gal	soil	Soil from Site 9.	30	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
12	12/15/98	55 gal	soil	Soil from Site 9.	26	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
13	12/15/98	55 gal	soil	Soil from Site 9.	30	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
14	12/15/98	55 gal	soil	Soil from Site 9.	28	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
15	12/16/98	55 gal	soil	Soil from Site 9.	24	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
16	12/16/98	55 gal	soil	Soil from Site 9.	32	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
17	12/15/98	55 gal	soil	Soil from Site 9.	30	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
18	12/15/98	55 gal	soil	Soil from Site 9.	32	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
19	12/15/98	55 gal	soil	Soil from Site 9.	26	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2

LLRM Inventory Log
SWDIV RAC Contract No. N68711-93-D-1459, DO 123
Naval Air Station North Island (NASNI)
Installation Restoration (IR) Sites 2 and 9

Drum /Bin #	Date Filled	Size	Matrix	Contents Description	Dose Rate[5] (µrem/hr)	Label(s)[6]	See Note
20	12/16/98	55 gal	soil	Soil from Site 9.	22	Caution Radioactive Material Contents: Soil Drum Number & Date Filled	2
21	12/17/98	30 gal	1 object	Small glass bottle fragment with a visible Cs-137 hot spot on it. The bottle fragment is inside a 2 gallon plastic pail. Found at Site 9.	16	Caution Radioactive Material Contents: Cs-137 object Drum Number & Date Filled	3
5064	12/19/98	13 CY	soil	Soil from Site 2.	11-14	Caution Radioactive Material	4
4960	12/19/98	13 CY	soil	Soil from Site 2.	10-13	Caution Radioactive Material	4
4753	12/19/98	13 CY	soil	Soil from Site 2.	13-21	Caution Radioactive Material	4
5063	12/19/98	13 CY	soil	Soil from Site 2.	10-18	Caution Radioactive Material	4
5065	12/19/98	13 CY	soil	Soil from Site 2. Includes plastic sheeting that had been laid under the stockpile. Includes small amount of PPE.	11-13	Caution Radioactive Material	4

Notes:

1. Sand and small metal debris.
   10,000-130,000 counts per minute on contact with material.
   Dose rate 20-200 µR/h.

2. Soil was sampled from the Site 9 stockpile (before putting in drums):
   Sample20603-006A activity was 68.4 pCi/g Ra-226 and 2.5 pCi/g Cs-137.
   Sample 20603-007A activity was 48.8 pCi/g Ra-226 and 3.9 pCi/g Cs-137.

3. The Cs-137 object was not counted in the HPGe. Geometry not suitable for an accurate count.

4. Soil was sampled from the Site 2 stockpile (before putting in bins):
   Sample20603-036A activity was 46.8 pCi/g Ra-226 and 0.15 pCi/g Cs-137.
   Sample 20603-037A activity was 75.4 pCi/g Ra-226 and 0.20 pCi/g Cs-137.
   Sample20603-038A activity was 8.4 pCi/g Ra-226 and 0.08 pCi/g Cs-137.
   Sample 20603-039A activity was 15.3 pCi/g Ra-226 and 0.10 pCi/g Cs-137.

5. Dose Rates were measured one meter from the container surface. Dose rates should not be used for shipping purposes, but rather to satisfy sign posting requirements

6. DOT shipping name for all containers is as follows:
Radioactive Material, low specific activity, n.o.s., UN 2912

The waste generator is:
Navy Public Works Center, (619)556-8647
EPA Number CA9170023130
2730 McKean Street, Suite 1
Naval Station, San Diego, CA 92136

Please contact Mike Abel at (619)239-1690, ext. 118 or Rusty Rimmer at (619)533-7307 regarding storage of the containers.